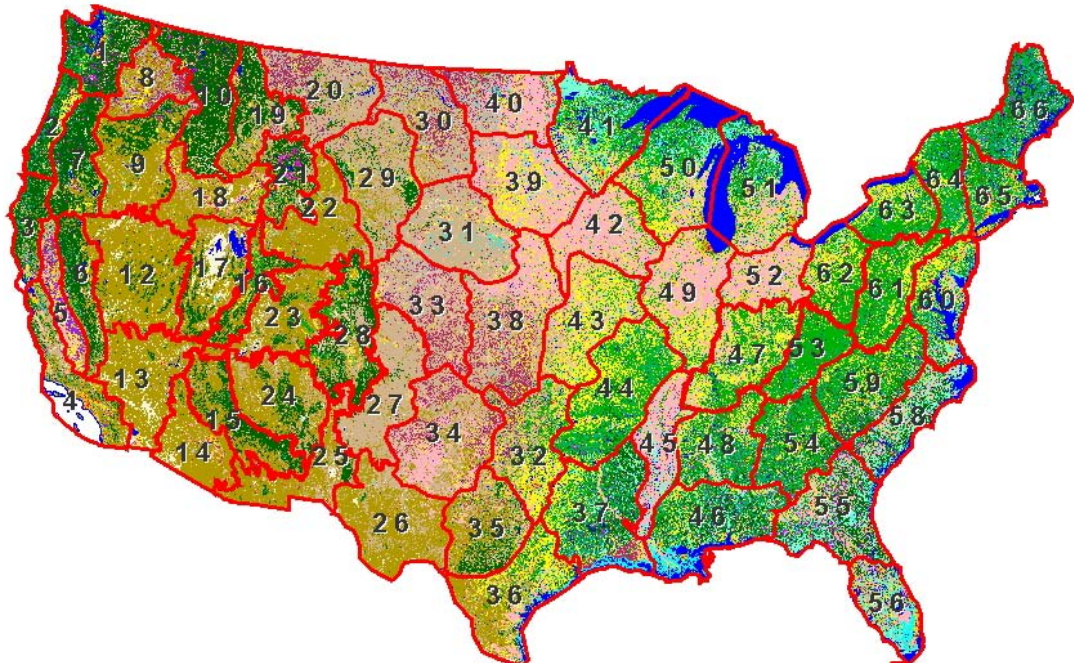
Report on 2001 NLCD



1. New emphasis on partnerships
2. Database and mapping methods
3. Proposed prototype change product
4. Status

Lead Land Cover Partners, By NLCD 2001 mapping Zone

USGS

EPA

NOAA

USFS

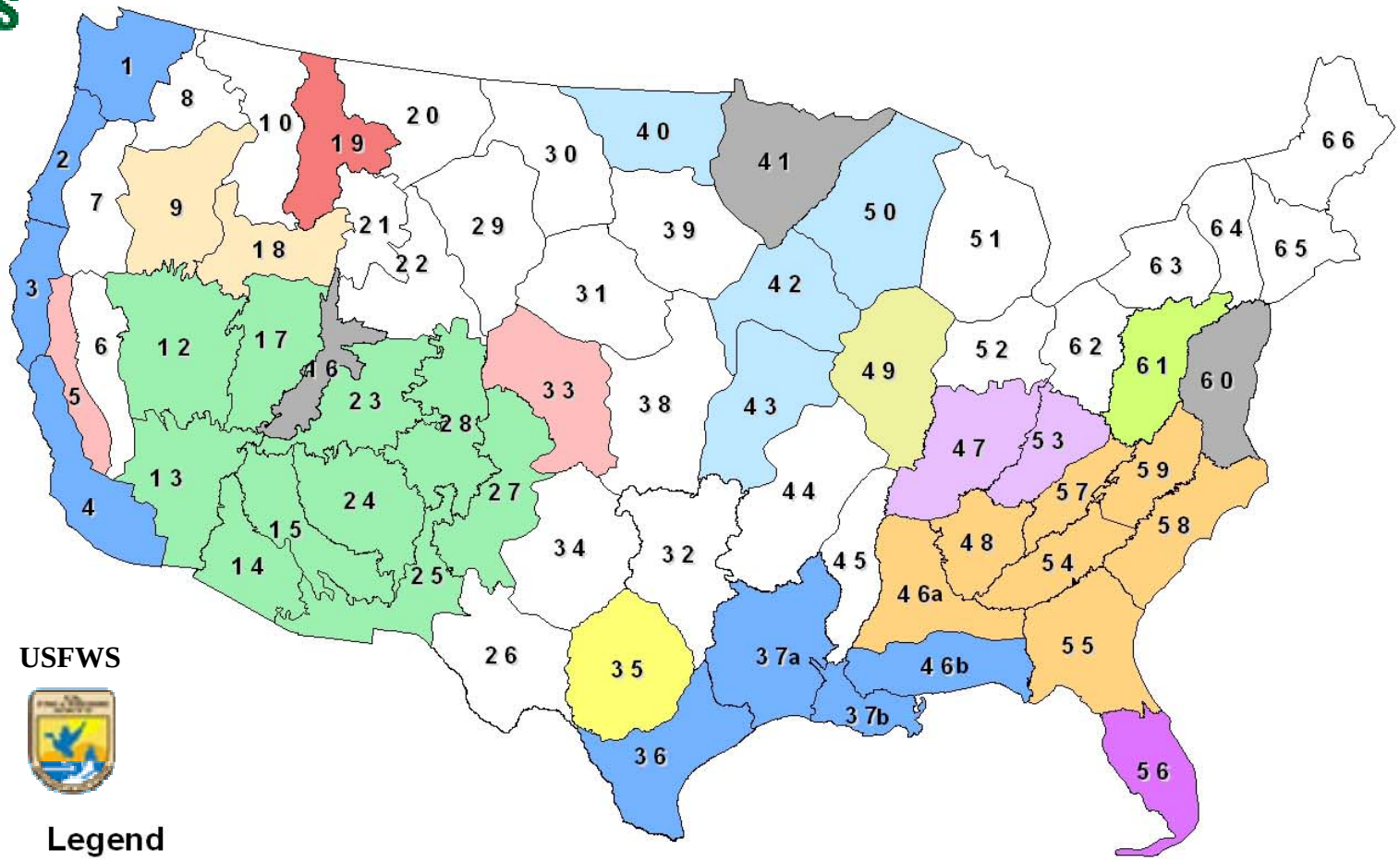
USDA

BLM

NPS

NASA

USFWS



Legend

- Mapping Completed
- NOAA
- EPA
- USGS- SW GAP
- USGS- RMMC
- USGS - BRD
- LAND FIRE
- NASS
- USGS- SE GAP
- USGS- MAC
- USGS- MAGAP
- State of Illinois/NASS
- State of Kentucky/NASA

Updated Jan 30, 2004

2001 NLCD Land-cover Legend

- **Water**
  - Open Water
  - Perennial Ice/Snow
- **Developed**
  - Developed, Open Space
  - Low Intensity
  - Medium Intensity
  - High Intensity
- **Forests**
  - Deciduous
  - Evergreen
  - Mixed
- **Barren** (Rock/Sand/Clay)
- **Non-Vascular**
  - Lichens*
  - Moss*

- **Shrubland**
  - Dwarf Shrub*
  - Shrub
- **Grasslands/Herbaceous**
  - Herbaceous
  - Sedge Herbaceous*
- **Agriculture**
  - Pasture/Hay
  - Cultivated Crops
- **Wetlands**
  - Woody Wetlands
    - Palustrine Forested Wetland**
    - Palustrine Scrub/Shrub Wetland**
    - Estuarine Forested Wetland**
    - Estuarine Scrub/Shrub Wetland**
  - Emergent Herbaceous Wetlands
    - Palustrine Emergent Wetland**
    - Estuarine Emergent Wetland**
    - Palustrine Aquatic Bed**
    - Estuarine Aquatic Bed**

* Alaska only
**Coastal NLCD only

NLCD 2001 Database

Tiled by Mapping Zone

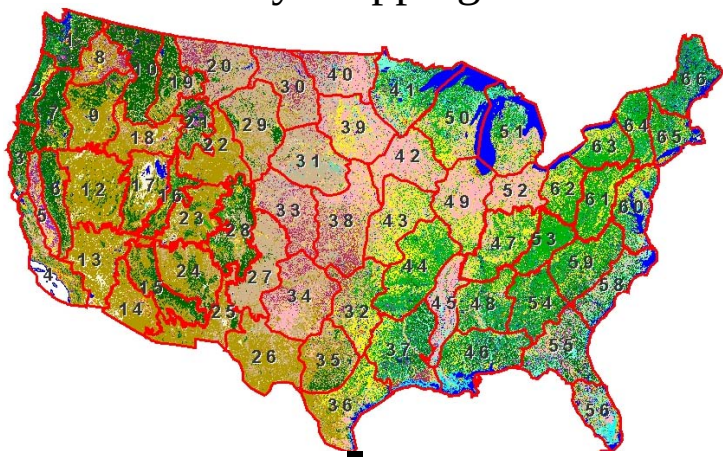
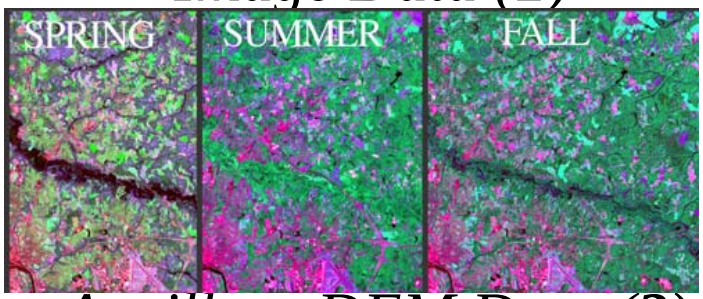
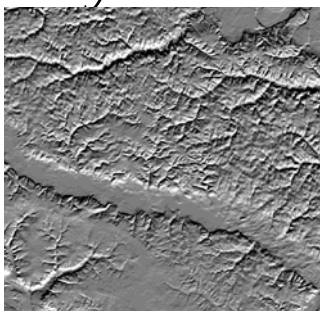


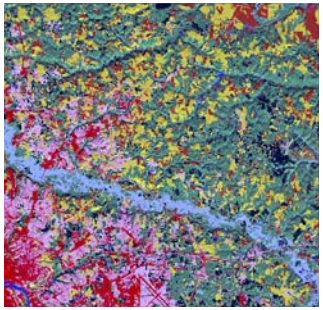
Image Data (1)



Ancillary DEM Data (2)

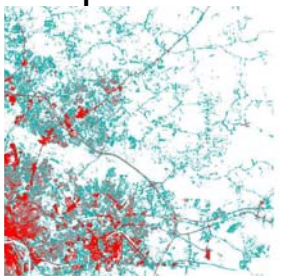


Land cover (4)

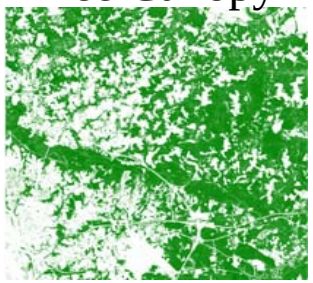


Derivatives (3)

Imperviousness

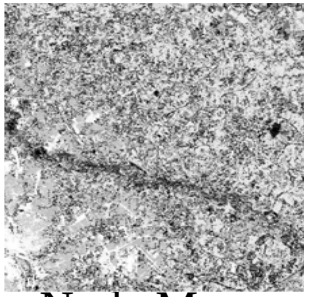


Tree Canopy

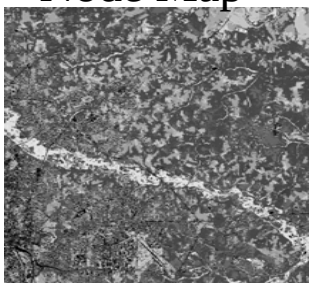


Metadata (5)

Confidence Estimate



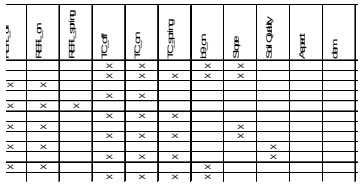
Node Map



Decision Rules

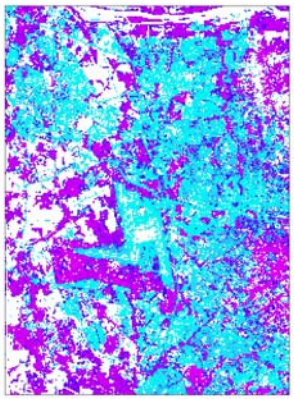
IF Node_map = 169
spring TC_green < 73
& summer TC_green > 90
& DEM > 245
& aspect = 9
Then = Deciduous

Cross-Validation Accuracy

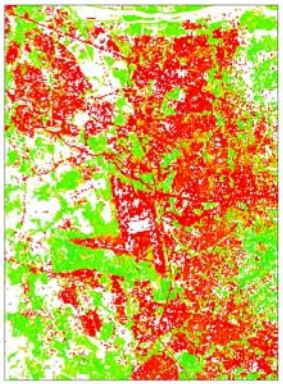


Primary Components of 2001 NLCD Database

• **Land cover**



• **Impervious Surface**



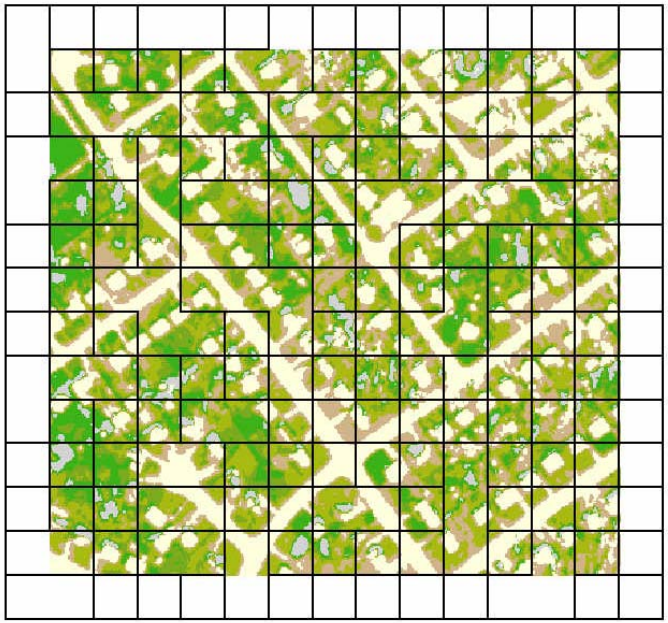
• **Canopy Density**

Ancillary & Metadata

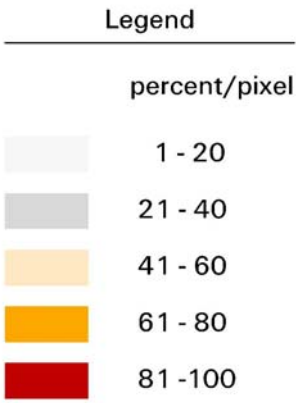
- Node map
- Confidence Map
- Landsat Imagery
- Digital Elevation
- Cross Validation
- Decision Rules

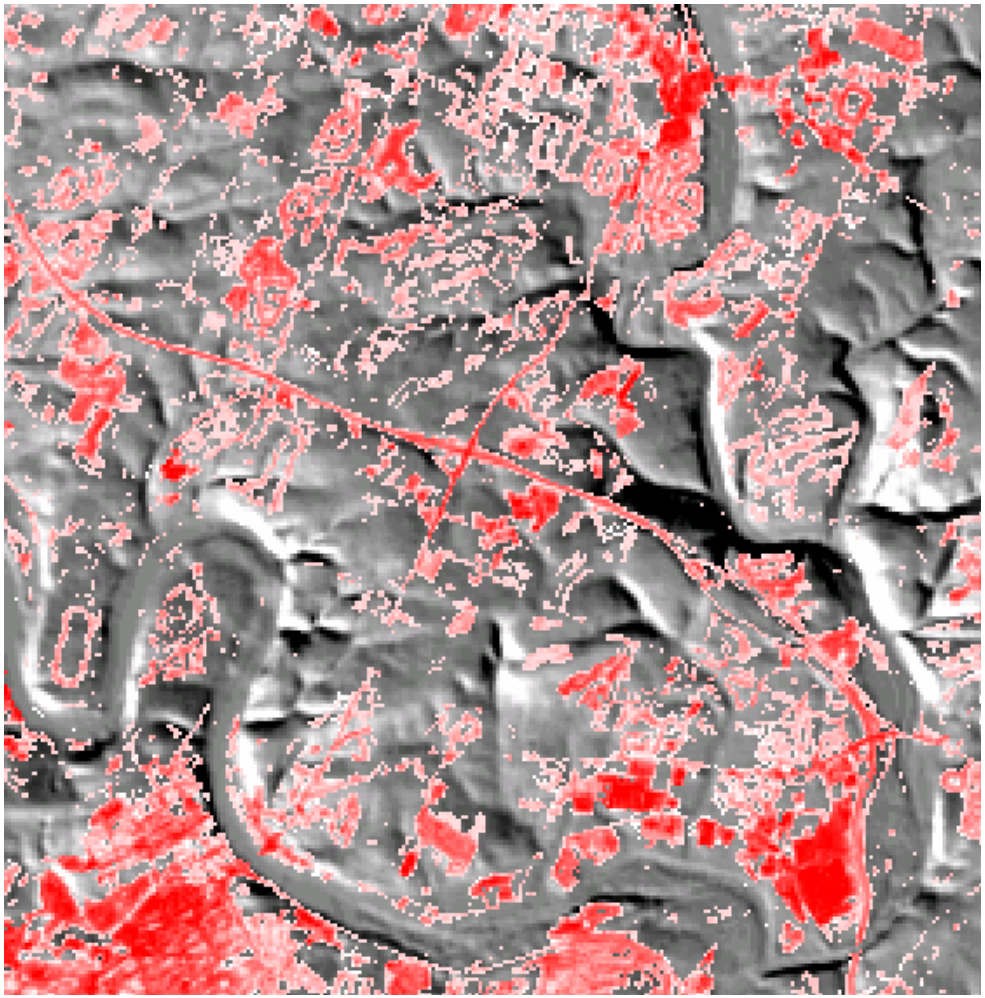
Impervious Surface Component of 2001 NLCD Database

Estimated % impervious surface from DOQ



Rescalable to user's requirements
-Relatively accurate (R^2 ~ .8)
-Efficient creation methods
-Very objective and repeatable
-Comprehensive metadata including confidence map
-Immediate QA using cross-validation



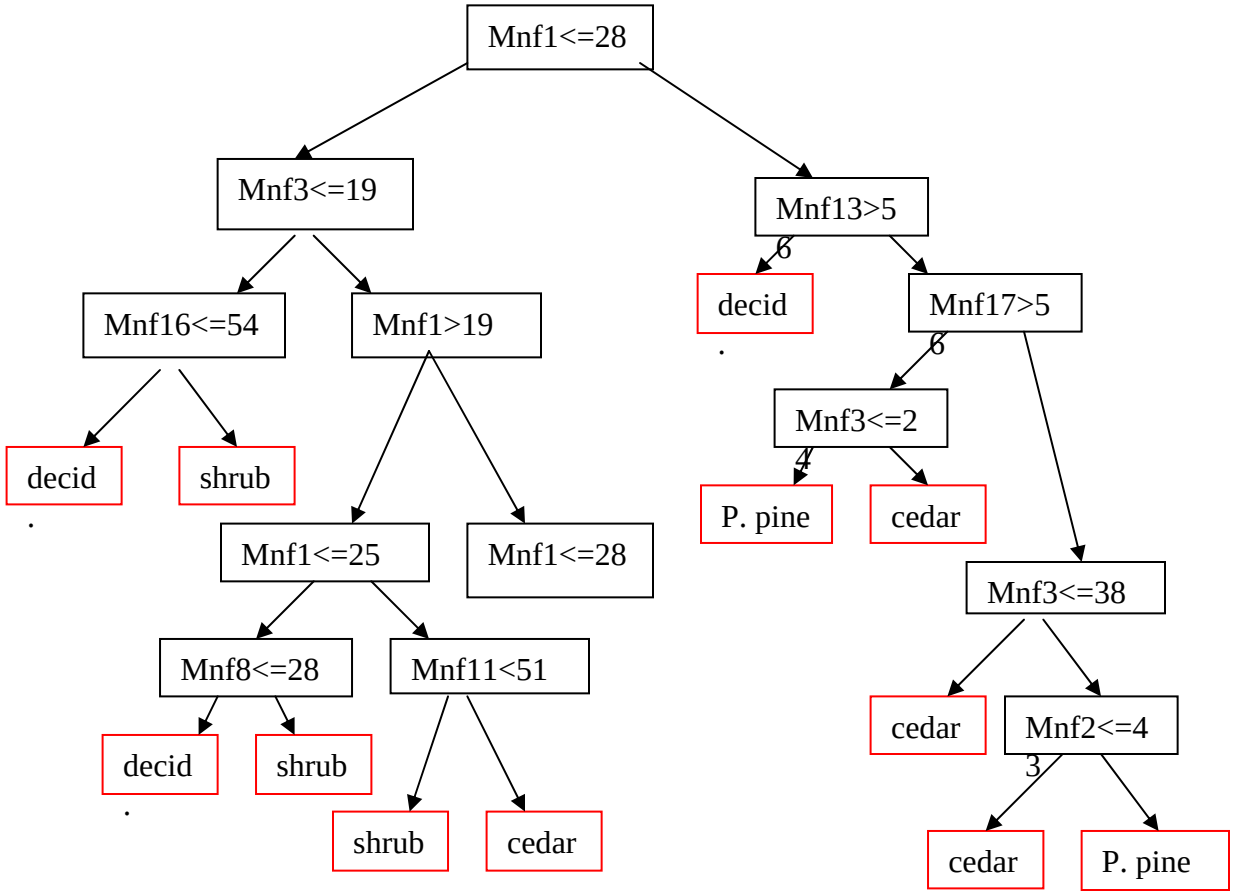


Node Map Component of 2001 NLCD Database

Decision Tree

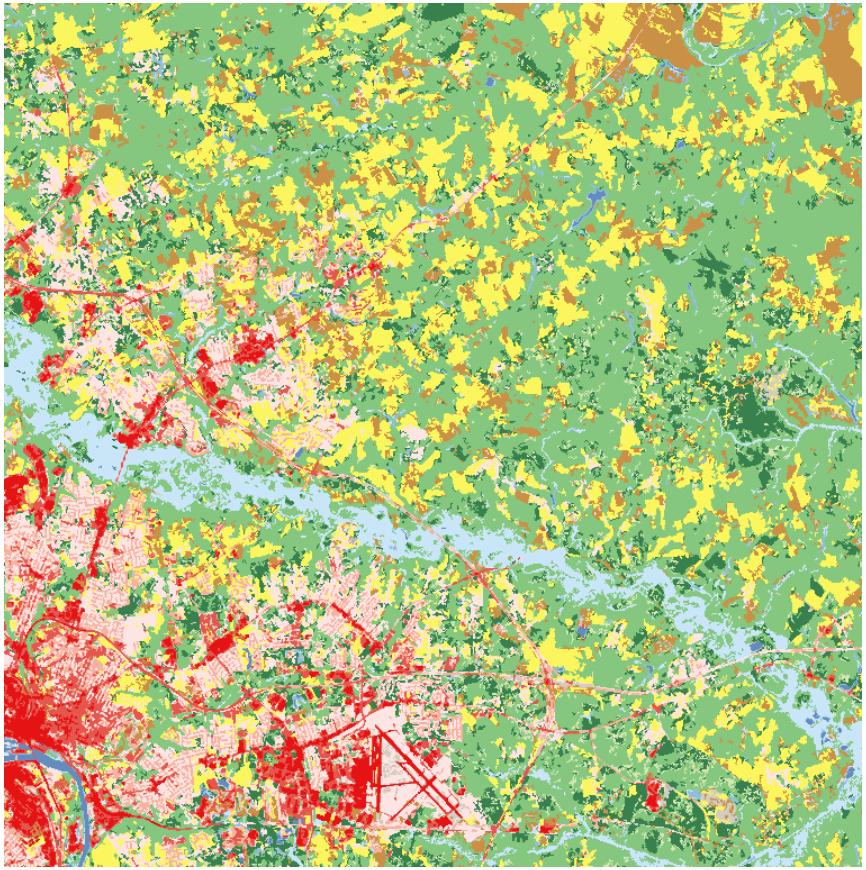
```
Decision tree:

dem <= 47:
:...dem <= 31:
:   :...17b7 > 28:
:   :   :...17b1 > 49:
:   :   :   :...slope <= 24:
:   :   :   :   :...posidx <= 182: 11 (44/9)
:   :   :   :   :   posidx > 182: 12 (4/1)
:   :   :   :   slope > 24:
:   :   :   :   :...17b4 <= 78: 8 (2)
:   :   :   :       17b4 > 78:
:   :   :   :       :...17b7 <= 43: 6 (3/1)
:   :   :   :           17b7 > 43:
:   :   :   :           :...17b1 <= 58: 12 (7/1)
:   :   :   :               17b1 > 58: 10 (3/1)
:   :   :   17b1 <= 49:
:   :   :   :...sb3 <= 132:
:   :   :       :...posidx > 154:
:   :   :       :   :...17b3 > 34: 12 (6)
:   :   :       :   :   17b3 <= 34:
:   :   :       :   :   :...17b3 <= 30: 10 (2/1)
:   :   :       :   :       17b3 > 30: 7 (6)
:   :   :       :   posidx <= 154:
:   :   :       :   :...17b7 <= 33:
:   :   :       :       :...17b7 <= 31:
:   :   :       :       :   :...17b3 <= 32: 10 (5/1)
:   :   :       :       :   :   17b3 > 32: 12 (4)
:   :   :       :       :   17b7 > 31:
:   :   :       :       :   :...17b5 <= 54: 11 (2)
:   :   :       :       :       17b5 > 54: 12 (2)
:   :   :       :       17b7 > 33:
:   :   :       :       :...dem <= 13: 11 (6)
:   :   :       :           dem > 13:
:   :   :       :           :...17b1 <= 44: 11 (3)
:   :   :       :               17b1 > 44: 10 (4/1)
:   :   :       sb3 > 132:
:   :   :       :...17b7 <= 33:
:   :   :           :...posidx <= 166: 10 (28/6)
:   :   :           :   posidx > 166:
:   :   :           :   :...slope > 87: 8 (2/1)
:   :   :           :       slope <= 87:
```

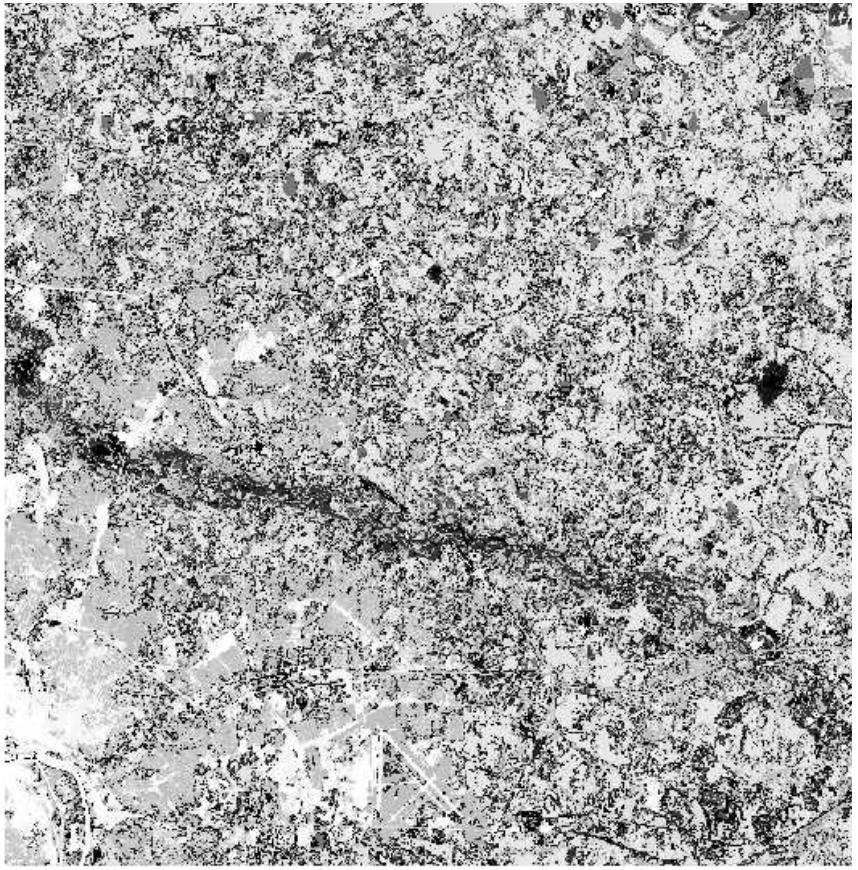


Each “terminal node” or “leaf” is assign a number that can be used with an associated text file to trace “history” of classification; logical rules (tree) can be use with of software.

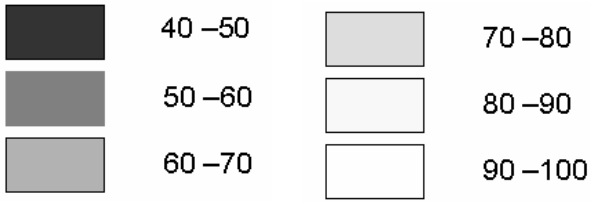
Confidence Map Component of 2001 NLCD Database



Land cover map



Classification confidence (%)



Prototype 1992 – 2001 NLCD Change Product

1) **compare NLCD 92 and NLCD 2001 at Anderson Level I and retain areas of land cover agreement.**

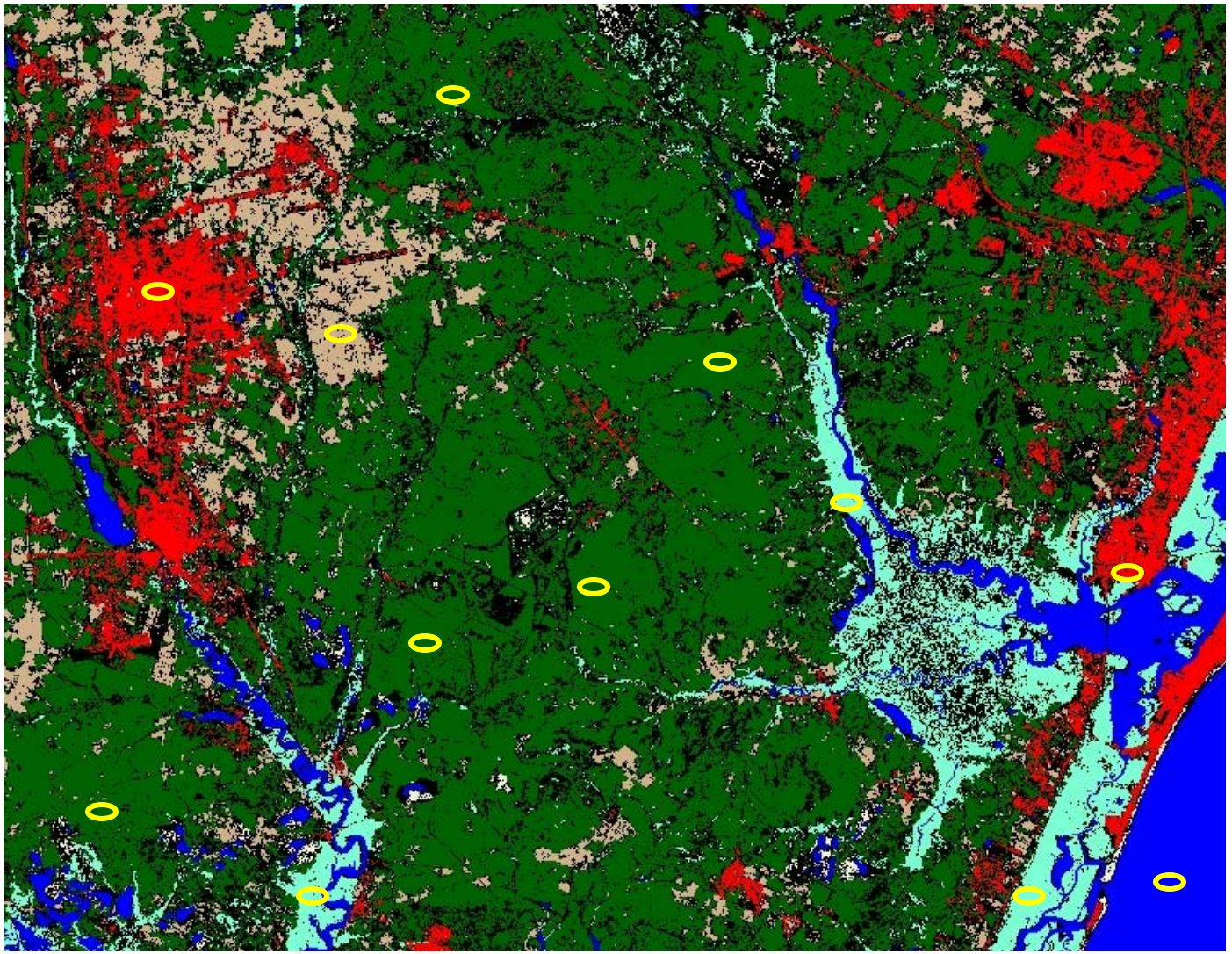
2) **draw thousands of training pixels from the agreement areas to train a decision tree re-classification of land cover using the 1992 image mosaic (essentially creating 1992 land cover with 2001 methods).**

3) **compare this re-generated Anderson Level I classification for NLCD 92 with the current NLCD 2001 and identify "areas of probable change" from disagreement areas.**

4) **conduct post-processing (filtering) of this "area of change" mask for distribution by mapping zone.**

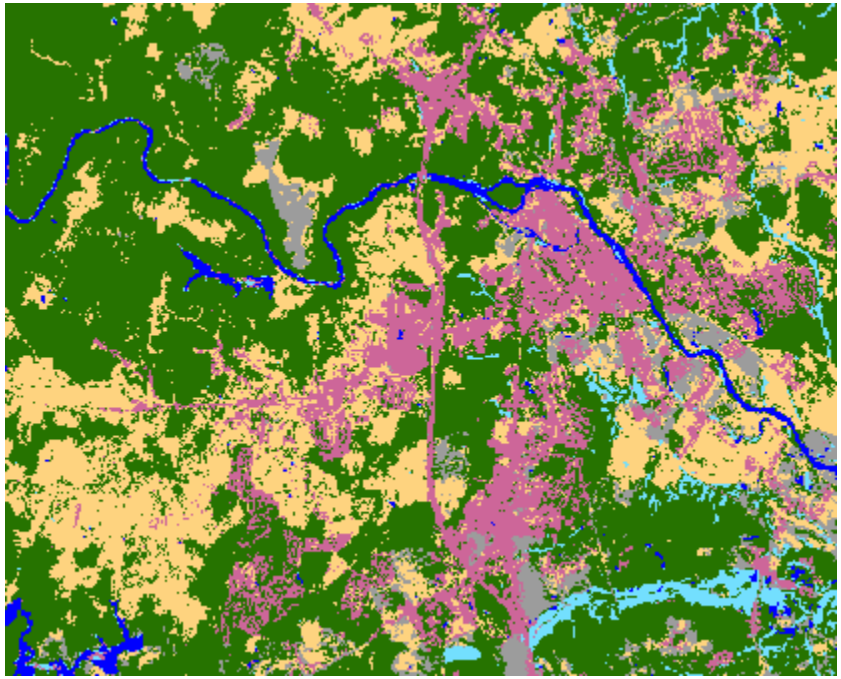
Prototype 1992 – 2001 NLCD Change Product

2. **draw thousands of training pixels from the agreement areas to train a decision tree to re-classify 1992 data.**

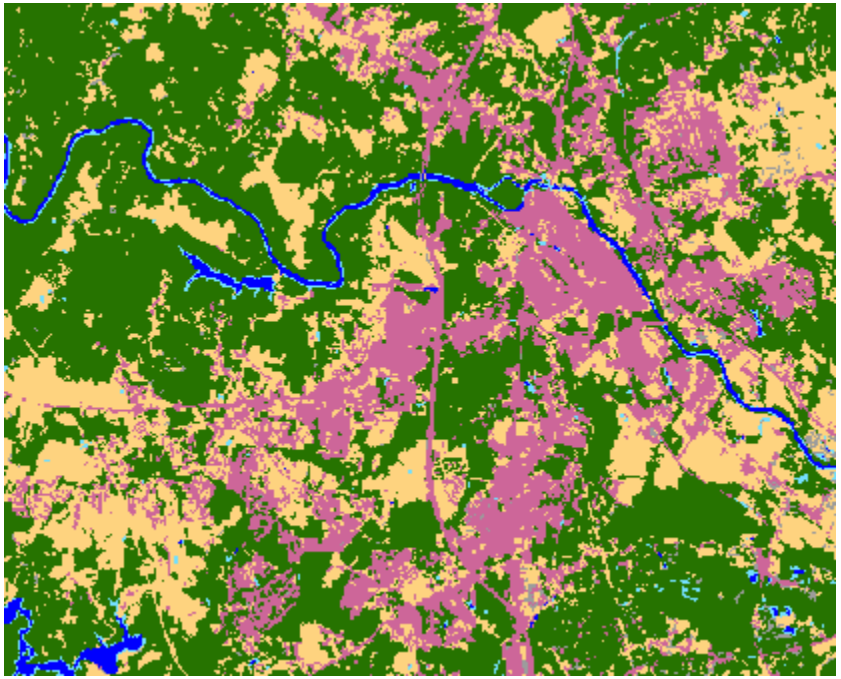


Comparison of Original and Adjusted 1992 NLCD

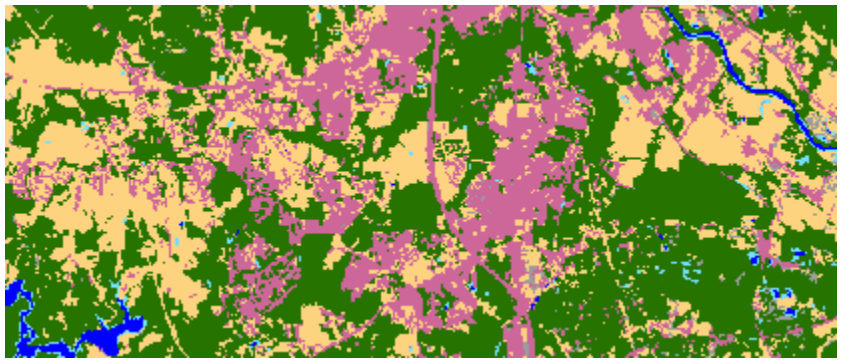
Original



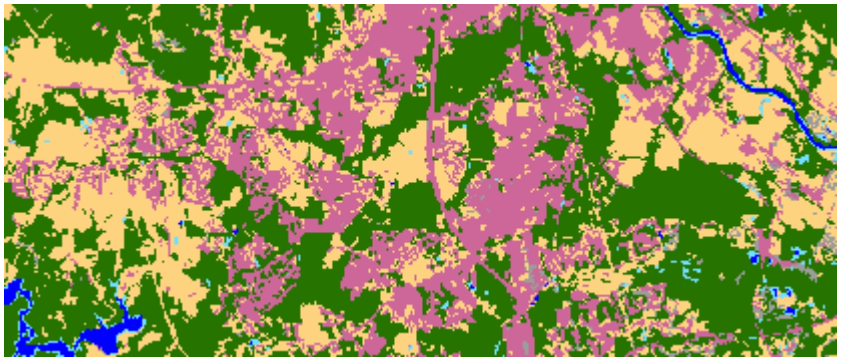
Adjusted



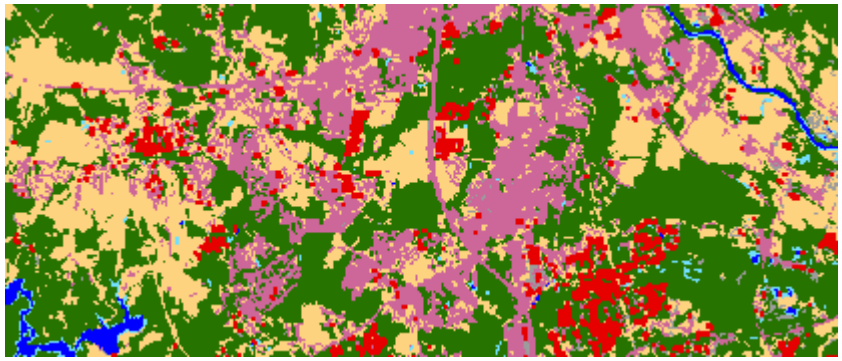
Comparison of Adjusted 1992 and 2001 NLCD



Adjusted 1992 NLCD

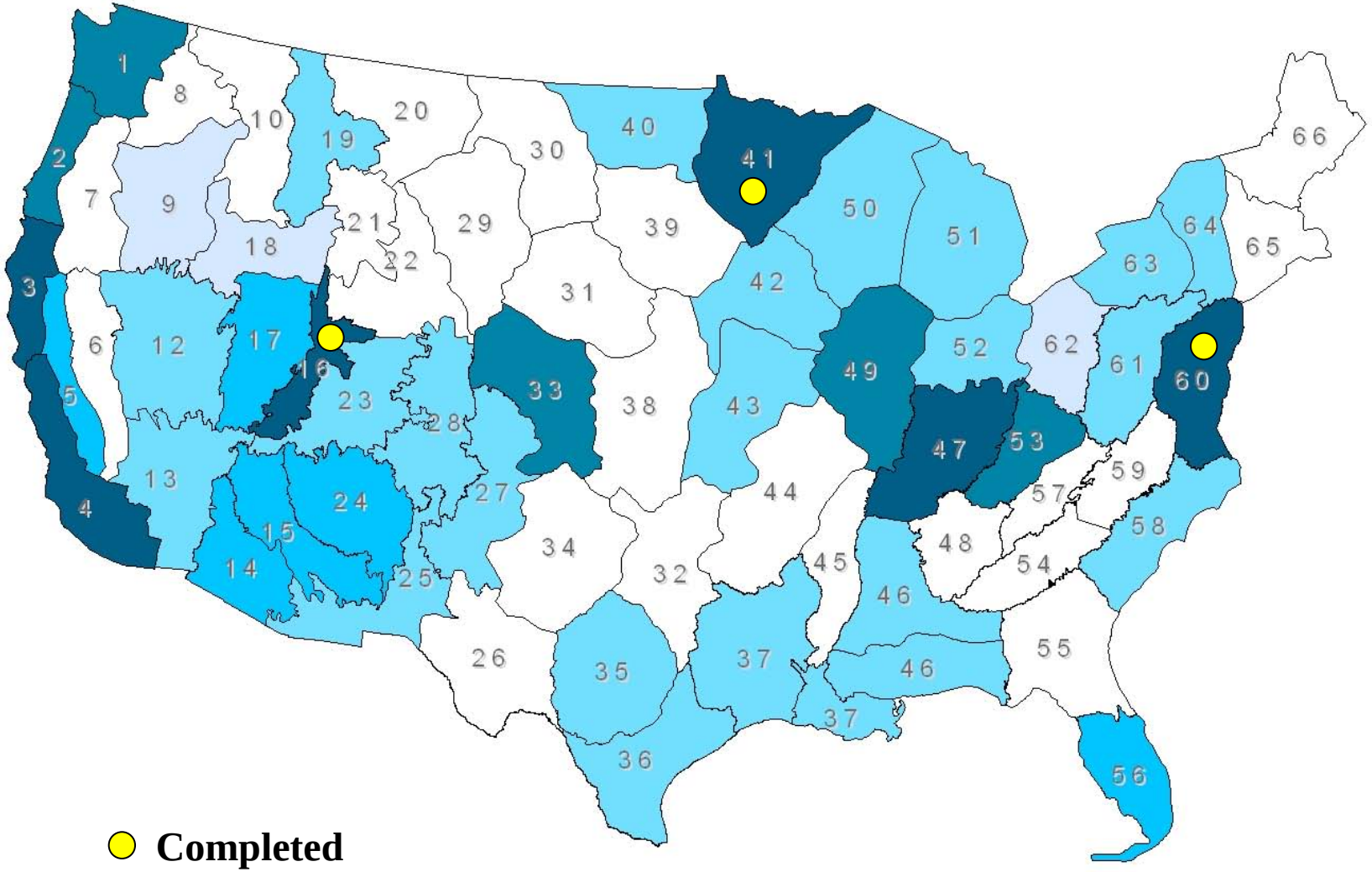


2001 NLCD



Change

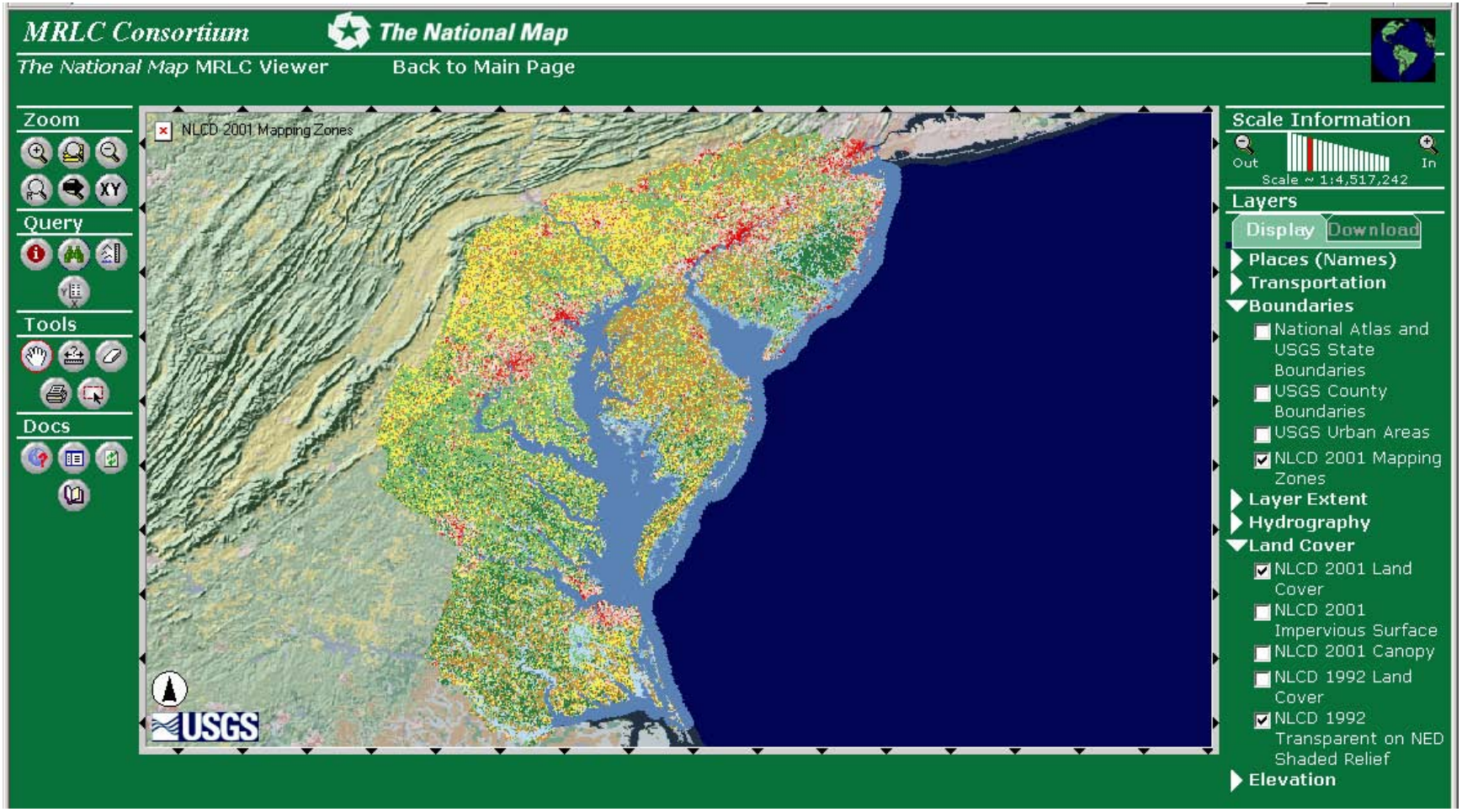
NLCD Current Completion Status:~30%



2001 NLCD Dissemination

http://www.mrlc.gov/

http://www.rsori.rtpnc.gov/



1992 NLCD Accuracy Assessment

- Completed national AA of NLCD 1992
  - By federal region (10)
  - Two-stage cluster design

    --18,000 samples (100/per class/per region)
  - a priori design evaluation (~$150K cost savings)[1]
  - Design follows statistical protocol

    -- (known inclusion probabilities)

Full Level II & I error matrices
http://www.epa.gov/mrlc

- Level I overall accuracy "meet" Anderson et al. 85% nominal standard, and includes scaled definitions of agreement and standard errors[2]
- Level I per-class user's accuracies often exceed 85% standard
- "spatial" distribution of error reported[3]

- **[1]Wickham et al. 2004, IJRS**
- **[2]Stehman et al. 2003. RSE; Wickham et al. in press, RSE; Yang et al. 2001, RSE**
- **[3]Smith et al. 2002. PE&RS, 2003 RSE**